

FINE-FILAMENT MAGNESIUM DIBORIDE SUPERCONDUCTOR WIRE FOR TURBOELECTRIC PROPULSION SYSTEMS, Phase I

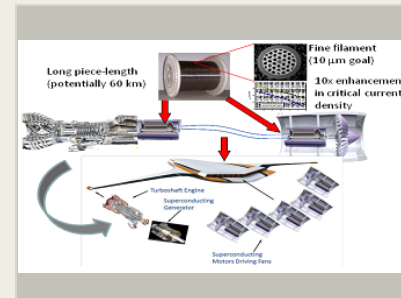
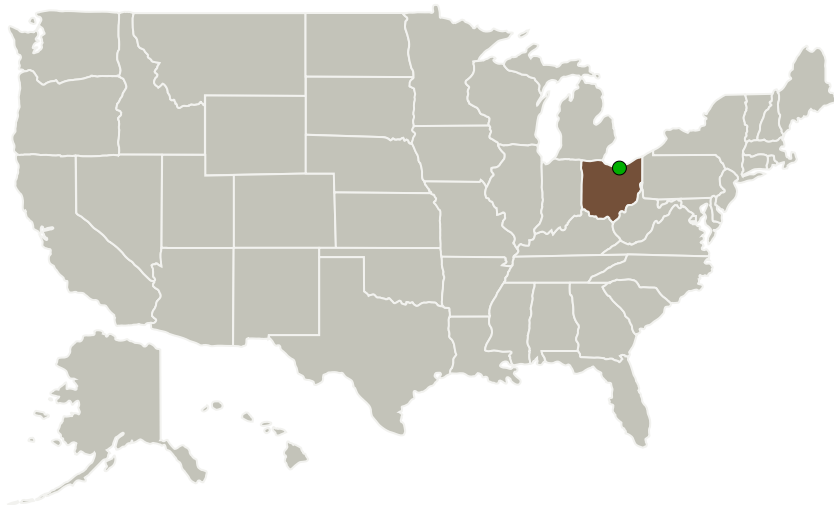
Completed Technology Project (2013 - 2013)



Project Introduction

The availability of low AC loss magnesium diboride (MgB₂) superconducting wires enables much lighter weight superconducting stator coils than with any other metal or ceramic superconductor. This, together with Hyper Tech's capability to fabricate long piece-length (potentially 60 km) wires, in turn enables lighter superconducting motors/generators, essential components in the turboelectric aircraft propulsion system envisioned in next generation Air Vehicle Technologies. To that end, this proposed SBIR Phase I program focuses on developing MgB₂ multifilament wires with the smallest practical filament size achievable (10 μm or less) as a means to reducing AC losses due to hysteresis, eddy current, and coupling losses. Two recent advancements at Hyper Tech greatly increase the odds of success: 1) The emergence of a novel MgB₂ wire manufacturing method that incorporates a magnesium-infiltration process (precursor materials are magnesium wire and powder boron) that has produced a 10-fold enhancement in critical current density over that of present state-of-the-art wires made by the conventional method involving magnesium-boron powder mixtures, and 2) Improved capability in wire drawing to fabricate fine multifilament strands.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Hyper Tech Research, Inc.	Lead Organization	Industry	Columbus, Ohio
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Ohio

Project Transitions

▶ **May 2013:** Project Start

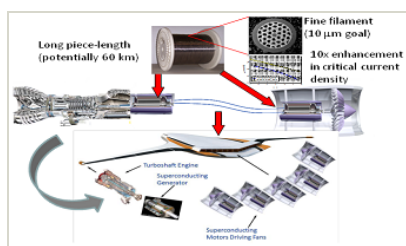
✓ **November 2013:** Closed out

Closeout Summary: FINE-FILAMENT MAGNESIUM DIBORIDE SUPERCONDUCTOR WIRE FOR TURBOELECTRIC PROPULSION SYSTEMS, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/140364>)

Images

**Briefing Chart Image**

FINE-FILAMENT MAGNESIUM DIBORIDE SUPERCONDUCTOR WIRE FOR TURBOELECTRIC PROPULSION SYSTEMS, Phase I
(<https://techport.nasa.gov/image/134412>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Hyper Tech Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Matthew Rindfleisch

Co-Investigator:

Matthew Rindfleisch

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Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System